

Teacher Quality and Changes in Initial Teacher Training

Research suggests that school quality is tightly linked to teacher quality (NCES 2000d). According to Hanushek (1992), “The estimated difference in annual achievement growth between having a good and having a bad teacher can be more than one grade-level equivalent in test performance.” Rivkin, Hanushek, and Kain (1998) recently concluded in one study that teacher quality is the most important determinant of school quality. Current research, however, has yet to definitively determine the specific, observable factors that distinguish a good teacher from a bad one. Research does suggest that the following factors are associated with teacher quality: having academic skills, teaching in the field in which the teacher received training, having more than a few years of experience (to be most effective), and participating in high-quality induction and professional development programs (NCES 2000d). Data relating to these issues were collected by the NCES during academic year 1999/2000 through the Schools and Staffing Survey (SASS). Data from sources other than the SASS have been included, to the extent possible.

Nationally representative data on teacher quality, professional development, and working conditions have been collected by the National Center for Education Statistics’ (NCES) 1999–2000 Schools and Staffing Survey. They were not available in time for the preparation of this chapter. Following release of the dataset by NCES, analyses of these topics will be available at the following National Science Foundation website: <http://www.nsf.gov/sbe/srs/seind02/update.htm>.

Measuring Academic Skills of Teachers

Research shows that students tend to learn more from teachers with strong academic skills than they do from teachers with weak academic skills (Ballou 1996; Ferguson and Ladd 1996; Ehrenberg and Brewer 1995, 1994; Ferguson 1991; Mosteller and Moynihan 1972). Some researchers argue that teacher quality has less to do with how teachers perform on standardized tests than with how they perform in the classroom (Darling-Hammond 1998). Although traits not measured on standardized tests (such as interpersonal skills, public speaking skills, and enthusiasm for working with children) influence whether someone will be an effective teacher, these traits tend to be hard to quantify, and most studies examining the link between teacher skills and student learning limit their definitions of teacher skills to academic skills (NCES 2000d).

Several studies show that over the past three decades, teachers with low academic skills have been entering the profession in much higher numbers than teachers with high academic skills (Henke, Chen, and Geis 2000; Gitomer, Latham, and Ziomek 1999; Ballou 1996; Henke, Geis, and Giambattista 1996; Murnane et al. 1991; Vance and Schlechty 1982). However, a recent study by the Educational Testing Service (ETS)

suggests that the pattern for potential mathematics and science teachers may be different. ETS found that the teaching profession tends to attract teachers with below-average skills, based on the Scholastic Aptitude Test (SAT) scores of prospective teachers taking the Praxis II between 1994 and 1997 (Gitomer, Latham, and Ziomek 1999).¹⁰ Based on a comparison of SAT scores for teacher candidates passing the Praxis II exam with the average score for all college graduates, ETS concluded that elementary education candidates, the largest single group of prospective teachers, have much lower math and verbal scores than other college graduates. The pattern in other content areas for teacher candidates was less consistent, however. The average math SAT score for those passing the Praxis II exam and seeking licensure in physical education, special education, art and music, social studies, English, or foreign language was lower than the average math score for all college graduates. Those seeking to teach science and math, however, had higher average math scores than other college graduates. The average verbal SAT scores of those seeking to teach some subjects were more encouraging. The scores of mathematics, social studies, foreign language, science, and English candidates who passed the Praxis II exam were as high as or higher than the average verbal SAT score for all college graduates. Physical education, special education, and art and music teachers scored below the average.

A major disadvantage of the ETS study, however, is that it examines only candidates, not those who actually take teaching jobs. Ballou (1996) demonstrated that there are large drop-offs in the pipeline. For example, although 20 percent of students from average colleges became certified to teach, 17 percent applied for teaching jobs and 8 percent actually became employed as teachers. Given such large drop-offs, one should not assume that individuals taking the Praxis II examination have the same characteristics as those who actually become teachers (NCES 2000d).

Several recent studies using data from the 1993 NCES Baccalaureate and Beyond Longitudinal Study provide more comprehensive pictures of the teacher pipeline, that is, from preparation at the baccalaureate level to employment (Henke, Chen, and Geis 2000; Henke, Geis, and Giambattista 1996). These studies found that the college entrance examination scores of 1992/93 college graduates in the teaching pipeline (defined by NCES as students who had prepared to teach, who were teaching, or who were considering teaching) were lower than those students who were not in the pipeline. “At each step toward a long-term career in teaching, those who were more inclined to teach scored less well than those less inclined to teach” (Henke, Geis, and Giambattista 1996). For example, by 1997, the 1992/93 college graduates in this study with the highest college entrance examination scores were consistently less likely than their peers with lower scores to prepare to teach, and when they did teach, they were less likely to teach students from disadvantaged backgrounds:

¹⁰The Praxis II assessments are designed to measure teacher candidates’ knowledge of the subjects they will teach and how much they know about teaching that subject.

- ◆ Graduates whose college entrance examination scores were in the top quartile were half as likely as those in the bottom quartile to prepare to teach (9 versus 18 percent).
- ◆ Teachers in the top quartile of college entrance examination scores were more than twice as likely as teachers in the bottom quartile to teach in private schools (26 versus 10 percent).
- ◆ Teachers in the top quartile of scores were about one-third as likely as teachers in the bottom quartile to teach in high-poverty schools (10 versus 31 percent).
- ◆ Graduates in the top quartile of scores who did teach were twice as likely as those in the bottom quartile to leave the profession within four years (32 versus 16 percent) (Henke, Chen, and Geis 2000).

Match Between Teacher Background and Courses Taught

Research shows that assigning teachers to teach courses that they are not trained to teach has a negative effect on student achievement (Darling-Hammond 2000; Goldhaber and Brewer 1997; Monk and King 1994). In the early 1990s, however, it was quite common for students to be taught mathematics and science by teachers without a major or minor in those subjects, especially in schools with large concentrations of poor and minority students or those in rural areas (Ingersoll 1999). This section examines the “mismatch” between those teaching mathematics and science and their educational backgrounds in those fields using data from a recently released national survey of teachers, the NCES SASS. Because it is common for an individual teacher to teach courses in multiple fields simultaneously, examining the match between a teacher’s main assignment field and his or her educational background can overestimate or, as is more likely, underestimate the amount of out-of-field teaching that is occurring. For this reason, the indicators presented below are calculated at the student level, that is, the percentage of students taught mathematics or science by a teacher without a major or minor in the related field. Unlike previously reported measures, these indicators attempt to measure the degree to which someone is teaching out of field, including whether he or she (1) has a major in the field at either the undergraduate or graduate level, (2) has a minor in the field, (3) has a major or minor in a related field of science, (4) has an education degree with a specialization in the field taught, or (5) has no previous education in the field as laid out in the four previous categories (referred to as “severely” out of field).

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Teacher Experience

Research suggests that students learn more from experienced teachers (those with at least five years of experience) than they do from less experienced teachers (NCES 2000d; Rivkin, Hanushek, and Kain 1998; Murnane and Phillips 1981). These studies point primarily to the difference between teachers with fewer than five years of experience (new teachers) and teachers with five or more years of experience. The benefits of experience, however, appear to level off after 5 years, and studies suggest that there are no noticeable differences, for example, in the effectiveness of a teacher with 5 years of experience versus a teacher with 10 years of experience (Darling-Hammond 2000). This section examines the proportion of students in middle and high schools who are taught by new teachers, defined here as teachers in their first three years of teaching.

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Induction of Recently Hired Teachers

Teacher recruitment and retention will become increasingly important as the baby boom generation reaches retirement age and its echo in terms of increased student enrollment makes its way through schools. In the 1980s and 1990s, large numbers of teachers left the profession after teaching just a few years. For example, between the 1993/94 and 1994/95 academic years, the most recent years for which national attrition data exist, 17 percent of teachers with three or fewer years of experience left the profession (NCES 2000d). Nine percent left after teaching for less than one year. A disproportionately high share left high-poverty schools. In efforts to retain good teachers, schools are increasingly using mentorships with master teachers and formal “induction” programs. This section examines the characteristics of the initial training of mathematics and science teachers who entered the profession between 1994/95 and 1999/2000 and examines the degree to which these new teachers reported receiving different types of support in their first year of teaching.

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